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## ON LIFTING MONOLITHS.

DEAR SCIENCE: It is a subject upon which I have frequently thought, but concerning which I have seen nothing written, that all the megalithic and Cyclopean structures of the world were erected at a time or under circumstances that may be called pre-mechanical. Neither in America nor in any other part of the world has the account of the moving of a 'big stone' been written down. There is not a modern machine capable of lifting some of these great stones and herein lies the *secréte*. If you will examine the twine, sennit, cables, ropes of modern savagery, you will at once see that in prehistoric times machinery could not have been utilized in lifting the great monoliths. There was not in all the world, during the periods when the megalithic monuments were being set up a derrick, or chain, or rope, capable of sustaining the weight. In Washington the stone cutters and contractors do not dream of hoisting the big stones that form the bases of monuments, though they are only pebbles compared with those of Teotihuacan or Baalbec. They move them on rollers, by means of crowbars and capstans turned by men or mules or horses, simple enough to have been familiar to the ancients. But even such affairs would be like rags hitched to a stone weighing a hundred tons or more. There is no use in looking for the machinery for the transportation of the megaliths; there was none. Time was the essential factor. A people that could pry up one end of a stone could put a roller under it. If they could move it twenty feet in a day, that would be over a mile in a year. Flotation, crib-work, inclined planes, levers, wedges were the utensils of horizontal and vertical motion. Count Wurmbrand has figured, in *Matériaux pour l'histoire primitive et naturelle de l'homme*, a company of men in India carrying a menhir upon a framework of wood and bamboo. If two hundred men could get around such a device and each bore two hundred pounds, the total weight could not exceed twenty tons. In studying the history of architecture one is almost justified in thinking that the size of the stone lifted has steadily decreased with the perfecting of lifting devices. Speed is the point aimed at. To fill a given space the modern

crane derrick will do the work quicker with small blocks and much cheaper from every point of view than it could be done with a single large block. Without dwelling further upon the economic side, the fact remains that all the megalithic and cyclopean structures of the world were erected by means of the co-operation of human hands, using the simplest mechanical powers and without lifting machines of any kind.

OTIS T. MASON.

## THE 'KANSAN' GLACIAL BORDER.

TO THE EDITOR OF SCIENCE: I have been extending the delimitation of the 'Kansan' glacial border westward from Lock Haven, Penna., during the past month, and a few of the points noted are of more than ordinary interest.

The first is regarding the possible existence of two glacial lobes from northeast and northwest which met and neutralized one another over the area north from Bradford, Penna., instead of proceeding south along the level valley of the Tunangeawant. A comparison of the 'Wisconsin' border of Lewis & Wright and the 'Kansan' border shows that they approach one another and almost coincide at the New York apex, while they diverge more and more as they extend southward. The 'Kansan' portion of the eastern lobe is lacking in fragments of crystalline rocks, while the same portion of the western lobe carries them. A study of the moraines of recession will easily settle the question thus proposed.

The second is that the 'Kansan' deposits over the Allegheny region bear out the deductions made from a study of similar deposits in eastern Pennsylvania that there has been but one epoch and that of comparative recency. A great deal of discussion has gone on regarding alleged 'high-level gravels' in the Allegheny region. This was on the basis of the 'Wisconsin' border being the extreme limit of ice action. The work of the past month shows that the Allegheny river was completely covered with ice as far south as Franklin (where the work is now being carried on), and all the localities noted by Messrs. Chamberlin, Wright and others along the tributaries to the Alle-